so it is very easy to direct the blue or the cadmium rays upon the face of the totally reflecting prism that throws the light into the substage condenser. By using two stops along the curved way on which it swings the illuminating apparatus can be made to stop automatically at the right place to throw the blue or the ultra-violet light into the microscope.

One great advantage of this system of focusing is that in studying living cells it is possible to do all the exploratory work and to focus exactly on the details to be photographed while using blue light. Only after the adjustments are made is the ultra-violet light thrown on for the few seconds necessary to make the photograph. This prevents injuring the cells with ultra-violet light before they are photographed—an injury to which many delicate cells are very subject, as shown by the investigations of Hertel.[6]

We have made a number of other minor improvements in the ultra-violet microscope, such as a swing-out screen to protect the eye and the microscope from the light of the spark; a pair of insulated rods to hold in place the wires that conduct the high tension electricity from the coil and leyden jars. The strength and the steadiness of the spark have been improved by inserting a few inductance coils in the circuit.

None of the changes are costly and the swing-out electrode holders can be made in a day by any good mechanic for a few dollars. On the other hand, owing to the increased precision in focusing, it will no longer be necessary to buy the whole series of expensive monochromatic lenses. For most biologists, the only one that will be needed is the highest power objective of 1.7 mm. focal length, which alone exceeds the ordinary oil immersion lenses in resolving power.

Finally, it should be noted that the monochromatic blue light of the magnesium spark is very useful for making photographs of microscopic mounts on glass slides with ordinary visual objectives. In fact, no other photomicrographic outfit is so convenient for every day use in a laboratory that is provided with an electric lighting circuit.

The improvements of the ultra-violet microscope here noted were described and exhibited in April, 1907, at the Washington meeting of the National Academy of Sciences and a few days later at the Washington meeting of the American Physical Society. An illustrated account of the ultra-violet microscope and our improvements, together with a few photographs showing its utility in the study of microscopic objects, as well as concise directions for setting up and using the outfit, has been prepared and will shortly be published as a Bulletin of the Bureau of Plant Industry, U. S. Department of Agriculture.

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[6] Hertel, E., Ueber Beeinflussung des Organismus durch Licht, speziell durch die chemisch wirksamen Strahlen, in *Zeitschr. f. allgem. Physiologie*, 4: 1–43, 1904.

### CONCERNING THE RELATIONSHIP OF PHYLLOSTICTA SOLITARIA TO THE FRUIT BLOTCH OF APPLES

DURING the past four years, the writer has been collecting specimens of apple leaves and fruits having spots on them caused by fungi. Recently these specimens were examined to determine what fungi are present in the spots. As a result of this examination, it was found that a fungus which caused spots on the leaves and fruits of a wild crab-apple (*Malus coronaria* (L.) Mill.) also caused spots on the petioles and underside of the midribs of the leaves and of the fruits of the common apple (*Malus Malus* (L.) Britton), a condition that might be anticipated.

The spots on the leaves of the crab-apple are either brown or white, about a millimeter in diameter, and with a distinct, raised, brown or purplish border. In the center of the spots there is a single, minute, black pycnidium (rarely more than one). The white spots may be older than the brown ones, both occurring side by side on the leaf. The spots on the

petioles and midribs of the common apple are also brown and sunken and contain one to several pycnidia, the spots occasionally coalescing.

The appearance of the fungus on the fruits of both the crab-apple and the common apple is similar and the effect is much the same. There are brown spots on the fruits, from one fourth to one half an inch in diameter, with a few to as many as fifty black pycnidia near the center of the spots, the spots often coalescing. The fungus prevents the further growth of the fruit in the infected area. The tissue becomes shrunken and firm and cracks are formed around the spots. This spotting of the common apple is the same as the disease described by Clinton[1] in 1902, under the name of "fruit-blotch (*Phyllosticta* sp.)," and, in considerable more detail, by Scott and Quaintance[2] in a bulletin recently issued by the United States Department of Agriculture.

Finding the fungus on the petioles of the common apple suggested the possibility that it might also occur on the branches. A search was at once made for it on a tree where it had previously been found on the petioles and fruits and it was found on both the yearling and older branches. It was more in evidence on the "water sprouts" and on the branches growing in partial shade than on those exposed to the direct sunlight, not only on this tree, but on others in the same orchard. The next day the fungus was found on the branches of the wild crab-apple tree where the first specimens of it were collected on the leaves and fruits.

On the twigs of last year's growth, there are light brown, flat, elliptical spots from one fourth to one half an inch in diameter, containing from a few to twenty to thirty black pycnidia. The bark is usually cracked and raised around the edge of the spot, giving it the appearance of a small canker. On the older branches the fungus grows out from the original spot and forms pycnidia around it. The formation of pycnidia outside of the point of primary infection in successive years indicates that the fungus is perennial and that it winters over on the branches. Pycnidia were developing this spring at about the same time that the apple trees were beginning to show signs of activity. After pieces of the infected twigs had been in a moist chamber a few days, small white masses of spores began to ooze out of the pycnidia. These spores germinated when seeded in a synthetic-agar culture medium and a mycelium developed. Infection of the leaves and fruit during the spring and summer is probably brought about by the spores that develop in the cankers on the branches.

The spots on the petioles, fruits, twigs and branches are much alike in size and general appearance, but they are five to ten or more times larger than the spots on the leaves of the crab-apple and the number of pycnidia in them is many times greater.

Several investigators, including those already referred to, seem to agree that the "fruit-blotch," "apple-blotch," "dry-rot," etc., is caused by a species of *Phyllosticta*, but what species is not indicated. The fungus as it occurs on the leaves of the wild crab-apple furnishes a clue for its determination. In 1895, Ellis and Everhart[3] described and named a fungus occurring on the leaves of the same host as *Phyllosticta solitaria* E. & E., which in all probability was the same as the one under consideration. Both have the "spots minute, 1 mm., round, pale white with a darker border. Perithecia epiphyllous, solitary, one in the center of each spot, 75 $\mu$ diam. Sporules sub-globose, hyaline, nucleate, 5–6 $\mu$ diam.," and, in addition, those collected by the writer have many of the spots brown and the pycnidia ("perithecia") and spores larger. There is a considerable variation in the size of the pycnidia on the same leaf and of the spores in a pycnidium. The spores found by the writer range from $5–6 \times 6–9\ \mu$, the smallest being about the

[1] Clinton, George P., "Apple Rots of Illinois," Univ. Ill. Bul. **69**: 190–191, February, 1902.

[2] Scott, W. M., and Quaintance, A. L., "Spraying for Apple Diseases and the Coddling Moth in the Ozarks," U. S. Dept. Agr. Bul. **283**: 14–18, April 29, 1907.

[3] Ellis, J. B., and Everhart, B. M., *Proc. Phil. Acad.*, 430, 1895.

same size as those of Ellis and Everhart.[4] Type specimens have not been seen by the writer. The pycnidia are somewhat larger on the fruits and branches, but the spores are about the same size as those on the crab-apple leaves. The following are the spore measurements: From the same crab-apple tree—leaves, 5–6 × 6–9 μ; fruits, 5–6 × 8–9 μ; branches, 6–7 × 9 μ. From the same common apple tree—petioles, 5–6 × 7–9 μ; fruits, 5–6 × 8–10 μ; branches, 5–7.5 × 7.5–10 μ. The largest spore measurements are mostly from fresh spores developed in the moist chamber. These spore measurements agree with those of Clinton's[5] "fruit-blotch" fungus.

From the above, it seems evident that the "fruit-blotch" disease of apples is caused by *Phyllosticta solitaria* E. & E. and that the fungus causing it may occur on either the leaves, fruits, or branches (or on one or more of them at the same time) of the wild crab-apple (*Malus coronaria* (L.) Mill.) and the common apple (*Malus Malus* (L.) Britton).

Specimens of the fungus on branches can be furnished to persons requesting them.

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HOLOTHURIAN NAMES

AN excellent memoir on "The Holothurians of the Hawaiian Islands" by Dr. Walter K. Fisher, of Stanford University, has just been published "from the Proceedings of the United States National Museum." As I had been informed that Dr. Fisher had fully subscribed to all the nomenclatural rules of the American Ornithologists' Union, I was curious to learn whether he had applied those rules to the nomenclature of the group in question. Years ago, being much interested in the echinoderms, I looked up various questions, with the result of finding unsatisfactory conditions in the naming of the group. The full history of the various episodes has not been given in the current histories by Ludwig (pp. 303–316) and others. I call attention to some here.

[4] Ellis, J. B., and Everhart, B. M., *Proc. Phil. Acad.*, 430, 1895.

[5] *Loc. cit.*

Dr. Fisher has referred to "*Holothuria* LINNÆUS, Systema Naturæ, 10th ed., 1758," as the source for that name. Evidently he had not consulted the volume cited, for there is no mention in it of any animal now called *Holothuria.*

In the tenth edition (I., p. 657) Linnæus defined his genus "260. HOLOTHURIA" as follows: "*Corpus* gibbum, nudum, ovale, natans. *Tentacula* sæpius ad alteram extremitatem, inæqualia numero et figura." He referred to it four species, (1) *physalis,* a Physaliid or "Portuguese man-of-war," and three other animals having no resemblance to holothurians. Unquestionably, the type of the genus and description was the first species.

In the twelfth edition (I., p. 1089) Linnæus modified his definition and, while including the four species of the tenth, added five species, (1) *frondosa* (*Cucumaria*), (2) *Phantapus* (*Psolus*), (3) *tremula* (*Holothuria* of moderns), (8) *pentactes* (*Cucumaria*) and (9) *priapus* (a worm). This is the starting point of the ordinary holothurian history.

One naturalist who was aware of these facts would not modify the nomenclature to correspond. It remains to be seen whether Dr. Walter Fisher or Dr. Hubert L. Clark will. The case is clear. If the tenth edition of the Systema is accepted as the starting-point, certainly *Holothuria can not* be retained with its modern limits, since the original was unaccompanied by reference to a single representative and the diagnosis is inapplicable. One of the synonyms of the modern genus must then replace *Holothuria. Fistularia,* the oldest, can not be used, as it was preoccupied. There are many later names, more or less applicable, but which one shall be used will depend on the limits given to the genus. If we accept it with the extent given by Ludwig, *Bohadschia* of Jäger (1833) may be taken. If it is limited by the exclusion of the group so named, *Trepang* (Jäger, 1833), *Sporadipus* (Brandt, 1835), *Thelenota* (Brandt, 1835) and several others are available, according to circumstances.

It may be added that *Actinopyga* should not be used for the genus first named *Mülleria* by Jäger, as Brandt had long before published a